

A REVIEW OF THE "STICK-TICKS," NEOTROPICAL BITING
MIDGES OF THE FORCIPOMYIA SUBGENUS MICROHELEA
PARASITIC ON WALKING STICK INSECTS
(DIPTERA: CERATOPOGONIDAE)¹

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Williston (1908) was the first to report on "stick-ticks" in his Manual of North American Diptera. On page 147 under the family Simuliidae he wrote: "What seems to be a distinct genus has long been known to me in a single imperfect specimen from the West Indies. The form will, I hope, be recognizable from the accompanying illustrations made by me many years since. (2, 2a, 2b). The specimen is exceedingly minute, and was discovered closely applied to and sucking the juices from the antenna of a phasmid." The sketches he made of the wing and head are clearly those of a ceratopogonid, and are probably of the species described in this paper as *Forcipomyia willistoni* n. sp.

In 1928 Fiebrig-Gertz gave an excellent account of the habits of a ticklike midge that he found parasitizing phasmids in Paraguay and described under the name of *Ceratopogon ixodooides*. In the same year Costa Lima (1928) described and figured a new species, *Forcipomyia obesa*, which was taken from a phasmid on the Rio Negro, Amazonas, Brazil. Mayer (1937) described the genus *Phasmidohelea* for the species *crudelis* Mayer taken on a phasmid at San Jose, Costa Rica. Later Mayer (1938) gave additional notes on *crudelis* from specimens taken by Bequaert on phasmids at Restrepo, Colombia. Seguy (1941)

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described a fourth species, *P. wagneri*, from a phasmid from Rio de Janeiro, Brazil. Forattini and Lane (1955) synonymized *Phasmidohelea* with *Forcipomyia* and renamed *crudelis* Mayer as *mayeri* nom. n. because of preoccupation in *Forcipomyia* by *Ceratopogon crudelis* Karsch, 1886, and *F. crudelis* Knab, 1914.

A close comparison reveals that in nearly all respects *Phasmidohelea* is quite similar to *Forcipomyia fuliginosa* (Meigen), an extremely abundant and worldwide species that sucks blood from caterpillars and sawfly larvae (Wirth, 1956; Dessart, 1963). *F. fuliginosa* is very similar to *F. microtoma* (Kieffer), the type-species of *Microhelea* Kieffer, and Kieffer's subgenus becomes available for *fuliginosa* and related species, as well as the phasmid parasites.

The distribution of the known phasmid parasites is almost exclusively neotropical. The only exception is the record by Edwards (1926) of *Forcipomyia hirtipes* (de Meijere) (variety ?) taken on a large phasmid on Buru Island, Indonesia, February 2, 1922, by L. J. Toxopeus. This specimen was borrowed from the Amsterdam Museum through the courtesy of Dr. Theowald van Leeuwen. From external study it appears to be a species of *Microhelea* close to *fuliginosa*, under which *hirtipes* is a synonym, with more slender proboscis than the neotropical phasmid parasites. Its specific identity must await a revision of the Oriental *Microhelea* species.

In this paper I give a diagnosis of the subgenus *Microhelea*, a brief diagnostic description of *F. Fuliginosa* for comparison with the phasmid parasites, a key for the separation of *fuliginosa* and the stick-ticks, and descriptions of four species in the latter group, including two that are new to science.

I am very much indebted to Dr. Carl W. Rettenmeyer of Kansas State University for sending me stick-ticks from Panama in 1957 and from Ecuador in 1971. Two photographs of *Forcipomyia obesa* Costa Lima from a remarkable series taken in the field by Dr. Rettenmeyer are shown in figure 1. I also wish to express my appreciation to Dr. Chester G. Moore of the University of Puerto Rico at Mayaguez for submitting material of *F. willistoni* n. sp. which he captured on phasmids in the El Yunque rain forest. For the opportunity to study the Indonesian phasmid parasite I wish to thank Dr. Theowald van Leeuwen of the Zoölogisch Museum der Universiteit van Amsterdam, Netherlands. I am grateful to Dr. Niphan Chanthawanich Ratana-worabhan for making the drawings in figures 2 and 3.

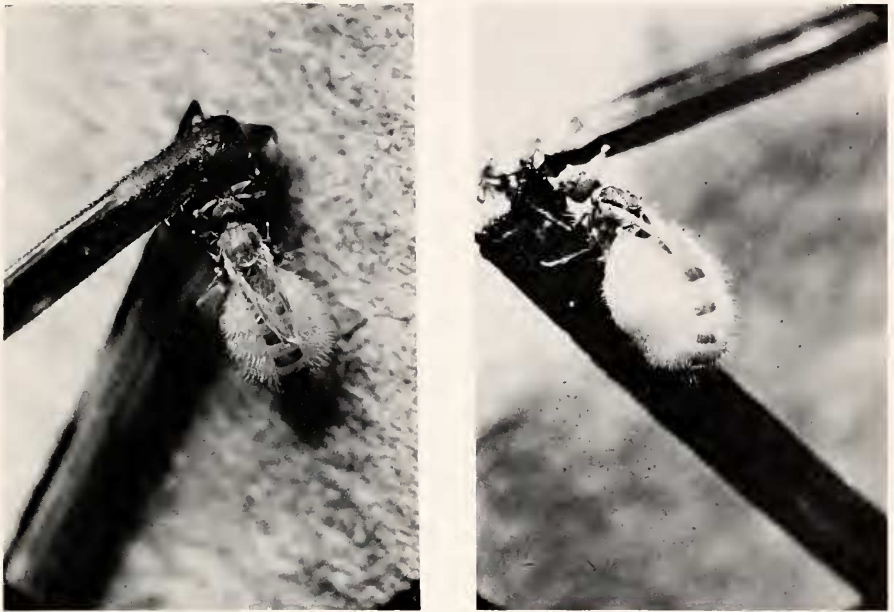


FIG. 1. *Forcipomyia obesa*, two views of females sucking blood from femorotibial articulation of a phasmid, Barro Colorado Island, Panama Canal Zone. Photographs from a Kodachrome transparencies by Dr. C. W. Rettenmeyer, Exakta with 50 mm Tessar lens.

Forcipomyia, subgenus *Microhelea* Kieffer, NEW STATUS

Microhelea Kieffer, 1917: 364 (as genus). Type-species, *Atrichopogon microtomus* Kieffer, by designation of Kieffer, 1921: 7 (Kieffer explains herein that his original designation of *Atrichopogon tropicus* Kieffer was a lapsus); Ingram and Macfie, 1924: 379 (in generic key to *Forcipomyia* group); Macfie, 1939: 145 (notes: probably *microtomus*, which is type-species of *Microhelea*, was denuded specimen of *F. inornatipennis* (Austen); Macfie, 1940: 17 (points out that Kieffer's original designation of *tropicus* as type-species was in error, and that *microtomus* is type species).

Phasmidohelea Mayer, 1937: 233. Type-species, *Phasmidohelea crudelis* Mayer, by original designation; Mayer, 1938: 13 (notes: figs.; key to spp.).
NEW SYNONYMY.

Forcipomyia, subgenus *Phasmidohelea* Mayer; Wirth, 1956: 358 (subgeneric status; diagnosis; hosts; list of spp.).

Diagnosis.—Size large for *Forcipomyia*, body usually 2-3 mm long, wing length 1.5-2 mm. Thorax almost uniformly brown to dark brown; mesonotum and scutellum clothed with abundant long semi-erect yellow hairs and short semiappressed brown to yellowish hairs.

Wing without pale spots, densely clothed with dark brown decumbent hairs; numerous long, slender, striated, dark scales on costa and on radial field, giving this portion of wing a darker, shaggy appearance. Costal ratio (CR—length of costa divided by wing length) about 0.50; first radial cell obsolete, the second with distinct lumen. Eyes bare, broadly contiguous above in both sexes. Antenna with proximal flagellar segments globular to short oval, distal five segments elongate, subcylindrical; antennal ratio (AR—combined lengths of antennal segments 11 to 15 divided by combined lengths of 3-10 in female) usually greater than 1.25. Maxillary palpus quite characteristic, five-segmented; third segment of female broadly inflated to well past middle, sometimes nearly to tip, with sensory pit quite deep, extending nearly to base of segment, opening near distal end of segment by a small round pore, near which on surface of segment are placed a number of peglike sensory spines; palpal ratio (PR—length of third segment divided by greatest breadth) characteristic of each species; fourth palpal segment longer than fifth, usually much longer, sometimes fifth quite small and globular. Male palpus slender, usually not much swollen proximally, the pit small and deep and opening near middle or on distal part of segment. Proboscis well developed; with expanded labella in phasmid parasites; slender apically in *fuliginosa* group. Mandible of female with distinct teeth, variable in size from numerous minute teeth in caterpillar parasites to fewer strong teeth in phasmid parasites. Maxilla (lacinia according to Gad, 1951) with minute lateral teeth in caterpillar parasites, and stout blunt teeth or corrugations in phasmid parasites. Legs with numerous long hairs and slender striated scales; basitarsus usually about half the length of second tarsomere (tarsal ratio or TR—length of basitarsus divided by length of second tarsomere). Empodium well developed in both sexes; claws curved, stouter and simple in female, long and slender with bifid tips in male. Two spermathecae present; genital sclerotization of female a slender, U-shaped band open caudally, flanking gonopore, with a pair of slender processes extending laterally from the open ends of the "U". Male genitalia similar to those of *Forcipomyia* s. str.; parameres forklike, fused proximally to half or more of total length, the breadth at the fork usually greater than at base, the distal prongs pointed.

Key to Species of the Subgenus *Microhelea*

1. Proboscis expanded at tip, lobes of labellum greatly expanded, platelike; mandible

- broad or expanded at tip with 15-25 fine to strong teeth; maxilla stout distally, usually with prominent transverse corrugations or stout blunt teeth 2
- Proboscis subcylindrical to slightly narrowed distally with lobes of labellum appressed to other mouthparts; mandible with slender, pointed tip and 30-60 minute teeth; maxilla slender and hyaline distally with minute lateral teeth . . . fuliginosa group of species.
2. Legs yellow without brown bands or markings; hairs on abdominal pleura arising from prominent brownish tubercles, no slender dark brown striated scales 3
- Legs brown or with brown bands; hairs on abdominal pleura not arising from prominent tubercles, slender dark brown striated scales present 4
3. Antenna and palpus prominently bicolored, yellowish proximally, distal five segments of antenna and two segments of palpus contrasting dark brown; third palpal segment broad, PR 1.77; mandible without prominent distolateral expansion; abdomen provided with brown hairs, amazonica n. sp.
- Antenna and palpus not prominently bicolored, antenna pale brown at base, distal five segments darker brown, palpus brown; third palpal segment moderately swollen, PR 2.16; mandible with prominent distolateral expansion; abdomen with prominent long golden hairs, especially on pleura, ixodooides (Fiebrig-Gertz)
4. Legs yellowish, femora with prominent subapical dark brown bands, midtibia brownish, fore and hind tibiae with subbasal brown bands; antenna brownish, slightly paler proximally; palpus dark brown, third segment only moderately swollen, PR 2.18-2.42, sensory pit opening on a prominent ventrodistal expansion; mandible with prominent distolateral expansion; striated scales of abdominal pleura mixed with fine golden hairs obesa Costa Lima
- Legs dark brown, without pale bands; antenna prominently bicolored, yellowish at base, distal five segments dark brown; palpus dark brown, third segment quite broad, PR 1.65, bluntly rounded ventrodistally; mandible without prominent distolateral expansion; striated scales of abdominal pleura not mixed with golden hairs willistoni n. sp.

Forcipomyia (Microhelea) fuliginosa (Meigen)

(Fig. 2)

Ceratopogon fuliginosus Meigen, 1818: 86 (Germany).

Forcipomyia fuliginosa (Meigen); Goetghebuer, 1933: 130 (combination; Congo); Goetghebuer, in Goetghebuer and Lenz, 1933: 13 (palearctic dist.; syns.: *Ceratopogon alboclavata* Kieffer, 1919; *Forcipomyia canaliculata* Goetghebuer, 1920); Mayer, 1937: 231 (on *Cabera* larva); Wirth, 1956: 357 (dist.; insect feeding records; syns.: *Ceratopogon crudelis* Karsch, 1886; *C. eriophorus* Williston, 1896; *C. propinquus* Williston, 1896; *C. flavus* Williston, 1896; *C. galapagensis* Coquillett, 1901; *C. hirtipes* Meijere, 1907; *F. brevipennis* Lundstrom, 1910; *C. inornatipennis* Austen, 1912; *F. squamosa* Lutz, 1914; *F. erucicida* Knab, 1914; *F. crudelis* Knab, 1914; *F. crudelis* Knab, 1914; *C. australiensis* Kieffer, 1917; *C. coquilletti* Kieffer, 1917; *C. tropicus* Kieffer, 1917; *Atrichopogon microtomus* Kieffer, 1917; *C. tropicus* Kieffer, 1917; *Atrichopogon microtomus* Kieffer, 1917; *C. alboclavatus* Kieffer, 1919; var. *F. ornatiscrus* Ingram and Macfie, 1924; *F. brookmani* Wirth, 1952); Remm, 1961: 170 (diagnosis; figs.; synonymy; Estonia dist.); Dessart, 1961: 170 (syns.: *F. atripennis* Goetghebuer, 1935; *F. auripila* Goetghebuer, 1935; *F. curtimana* Goetghebuer, 1935; *F. grisescens* Goetghebuer, 1935; *F. vicina* Goetghebuer, 1935); Dessart, 1963: 63 (redescribed; Africa; figs.; synonymy; syn.: *F. nilotheres* Macfie, 1924); Wirth, 1969: 575 (*F. galapagensis* valid sp.).

FEMALE.—Wing length 1.30-1.90 mm.

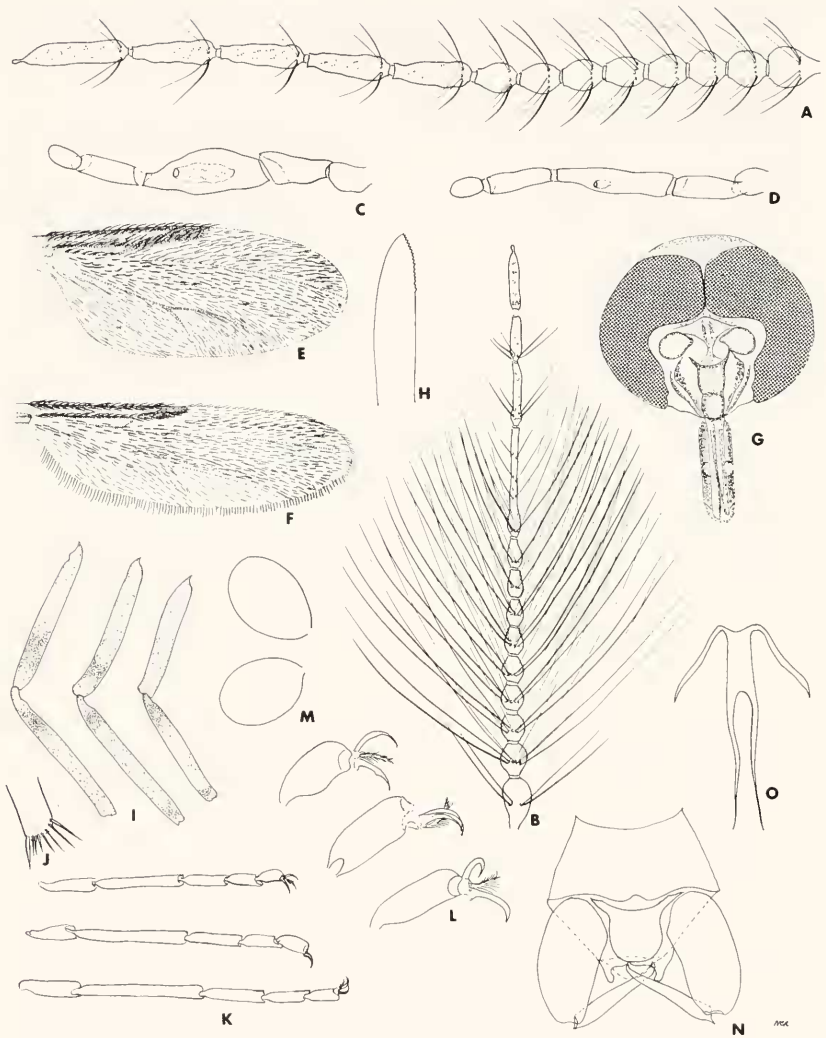


FIG. 2. *Forcipomyia fuliginosa* (Lake Placid, Florida): a, female antenna; b, male antenna; c, female palpus; d, male palpus; e, female wing; f, male wing; g, female head, cephalic view; h, female mandible; i, color pattern of femora and tibiae, left to right, of hind, mid and fore legs; j, hind tibial comb; k, female tarsi, top to bottom, of fore, mid, and hind legs; l, female fifth tarsomere and claws, top to bottom, of fore, mid, and hind legs; m, female spermathecae; n, male genitalia, parameres removed; o, male parameres.

Head: Dark brown including palpi; antenna yellowish on proximal flagellar segments, last five segments brownish. Antenna (fig. 2a) with length of flagellar segments in proportion of 35-26-26-27-27-28-28-30-56-58-60-60-80; AR 1.37. Palpal segments (fig. 2c) with lengths in proportion of 25-50-90-50-20; third segment markedly swollen from base to near tip, the latter with abrupt constriction to narrow apex just distad of level of sensory pore, the latter small and round, with a deep, slightly broader sensory cavity extending nearly to base of segment; surface of third segment bearing 6-8 small, stout, hyaline, sensory pegs scattered around sensory pore; PR 2.50-2.75. Proboscis (fig. 2g) subcylindrical to slightly tapering distad, labella not expanded; mandible (fig. 2h) moderately slender, pointed apically, bearing 30-60 minute teeth from tip proximad nearly to fulcrum; maxilla a slender hyaline stylet, armed on distal portion with approximately 25 minute teeth.

Thorax: Dark brown; mesonotum and scutellum with dense, yellowish, semi-erect long hairs, and short appressed setae. Legs (fig. 2l) yellowish with variable extent of broad brownish bands subapically on femora and subbasally on tibiae; with numerous long erect and semierect bristly hairs and shorter, and semiappressed narrow striated scales; tarsi (fig. 2k) with some long, rather stout ventral spines, especially at apex of basitarsus, less conspicuous on distal tarsomeres; TR approximately 0.60 on foreleg, 0.40 on midleg, and 0.50 on hind leg. Wing (fig. 2e) with dense appressed brownish macrotrichia, those on costa and over radial cells conspicuously longer and denser; CR approximately 0.50. Halter pale.

Abdomen: Brown, densely clothed with brown and golden-brown hairs and long striated blackish scales, the latter quite dense on pleura. Spermathecae (fig. 2m) two, oval to avoid, without necks, size somewhat variable, usually moderately small, measuring 0.065-0.080 mm in length and 0.035-0.060 mm in breadth.

Male.—Similar to female with usual sexual differences; antenna as in fig. 1b; third palpal segment (fig. 2d) only slightly swollen on proximal 0.6, with small round sensory pit located just proximad of midpoint. Genitalia (fig. 2n): Aedeagus with variable expansion of caudolateral lobes and caudomedium point. Parameres (fig. 2o) fused on proximal half, the fused portion moderately slender at base and somewhat expanded at the fork; distal prongs of the fork not closely appressed, sharp-pointed but not filiform.

Distribution.—Practically worldwide; known biting habits include sawfly larvae (Tenthredinidae) in Europe and Canada, and lepidopterous larvae, especially smooth-bodied caterpillars of Sphingidae, in Florida, West Indies, Central and South America to Argentina; Hungary, Sweden, Nyassaland, Manchuria, Ceylon, Indonesia, Taiwan, Samoa, and Fiji.

Discussion.—*Forcipomyia fuliginosa* is readily distinguished from the phasmid parasites or "stick-ticks" by the structure of the female proboscis, which is subcylindrical to slightly tapering in *fuliginosa*, but markedly expanded distally, with a greatly expanded, flaplike

labella, in the three species known to feed on phasmids, and in *amazonica* n. sp. whose habits are unknown. The mandible teeth are minute and extend farther proximad in *fuliginosa* than in the phasmid parasites, in some of which the distal portion of the mandible is greatly expanded with stout teeth. The structure of the mouthparts is no doubt correlated with the feeding habits of the midges, for the "stick-ticks" have repeatedly been observed to remain passively attached to the phasmid host while the abdomen expands into a ticklike sac full of the developing eggs, while the caterpillar parasites seem to be much more active, spending more time swarming around the hosts, and remaining attached for a much shorter period of time.

Wirth (1956) listed 18 synonyms of *fuliginosa*, and Dessart (1961, 1963) added six more, but a more critical study of the types and analysis of variation may reduce the number. For example Wirth (1969) found that a close study of fresh material of *galapagensis* (Coquillett) revealed specific differences in the tarsal ratio, female spermathecae, and male parameres and dististyle. I am now studying the neotropical species in this complex and can recognize a number of species very similar to *fuliginosa*, but with specific differences in these characters as well as mandible development, palpal structure, etc.

Forcipomyia (*Microhelea*) *ixodoidea* (Fiebrig-Gertz)

(Fig. 4a-d)

- Ceratopogon ixodoidea* Fiebrig-Gertz, 1928: 290 (female; Paraguay; on phasmid; figs.).
- Forcipomyia ixodoidea* (Fiebrig-Gertz); Costa Lima, 1928: 84 (combination; compared with *obesa*, n. sp.).
- Phasmidohelea crudelis* Mayer, 1937: 233 (female; Costa Rica; fig. mouthparts, tibial comb; in key); Mayer, 1938: 13 (Colombia; fig. habitus, mouthparts).
- Phasmidohelea wagneri* Seguy, 1941: 85 (female; Brazil; on phasmid; fig. lateral habitus, leg, tarsus, claws, palpus, mouthparts; in key). NEW SYNONYMY.
- Forcipomyia mayeri* Forattini and Lane, 1955: 4 (new name for *F. crudelis* (Mayer), preoccupied in *Forcipomyia* by *Ceratopogon crudelis* Karsch, 1886, and *F. crudelis* Knab, 1914); female redescribed from Panama; fig. antenna, palpus, tarsus, spermathecae, eggs). NEW SYNONYMY.

FEMALE.—Wing length 1.33 mm.

Head: Dark brown, proximal antennal segments pale brown. Antenna with lengths of flagellar segments in proportion of 40-28-30-30-30-30-31-35-73-70-70-66-87; AR 1.44. Palpal segments (fig. 4a) with lengths in proportion of 30-40-86-

53-28; third segment moderately swollen, sensory pore opening subapically on broadly rounded ventrodistal portion; PR 2.16. Mandible (fig. 4b) bearing 16-21 darkened teeth on a prominent distolateral expansion. Maxilla (fig. 4c) strongly developed and moderately stout distally, bearing approximately 125 stout, transverse, scraperlike teeth.

Thorax: Dark brown, mesonotum and scutellum with dense, golden, semierect long hairs, and short appressed setae. Legs yellowish, sometime hind femur with faint subapical brownish band; hind TR 0.52. Wing with dense appressed dark brown macrotrichia, those on costal margin and over radial cells conspicuously longer and denser; CR 0.54. Halter slightly to moderately infuscated.

Abdomen: Brown; covered with long golden hairs, those on pleura denser and stouter, arising from prominent brownish tubercles. Spermathecae (fig. 4d) without necks, ovoid to somewhat saclike, slightly unequal, measuring 0.105 by 0.070 mm and 0.098 by 0.067 mm.

MALE.—Unknown.

DISTRIBUTION.—Brazil, Colombia, Costa Rica, Panama, Paraguay.

TYPES.—*Ceratopogon ixodooides* (Fiebrig-Gertz) was described from females from Paraguay, locality data not stated, location or existence of types unknown. Type of *Phasmidohelea crudelis* Mayer, female, San Jose, Costa Rica, 24 April 1936, F. Nevermann, sucking blood from antenna of phasmid, *Crenoxylus spinosus* F., in collection of Deutsches Ent. Inst., Berlin-Dahlem. Type of *Phasmidohelea wagneri* Seguy, female, Organ Mountains, Rio de Janeiro, Brazil, 1902, E. R. Wagner, from phasmid of genus *Bacteria*, in Mus. Nat. Hist. Nat. Paris.

SPECIMENS EXAMINED.—COLOMBIA: Rio Raposo, Valle, January to July, 1963-1965, V. H. Lee, light trap, 19 females. COSTA RICA: Sabalito, Puntarenas Prov., August 1952, F. S. Blanton, light trap, 4 females; San Vito de Java, Puntarenas Prov., June 22, 1964, R. E. Woodruff, light trap, 1 female. PANAMA: Rivira Farm, Chiriqui Prov., 2200 ft., July 7, 1964, F. S. Blanton, light trap, 1 female.

DISCUSSION.—This species closely resembles *F. obesa* Costa Lima in the prominent distal expansion and coarse teeth on the female mandible, but can readily be distinguished by the legs, which in *obesa* bear extensive brown bands, by the greater distolateral expansion of the third palpal segment with the sensory pit opening apically on the expansion, and by the mixed dark brown scales and golden hairs on the abdominal pleura.

My fixation of the identity of *ixodooides* is based on the statement in the description by Fiebrig-Gertz that the abdomen is provided with

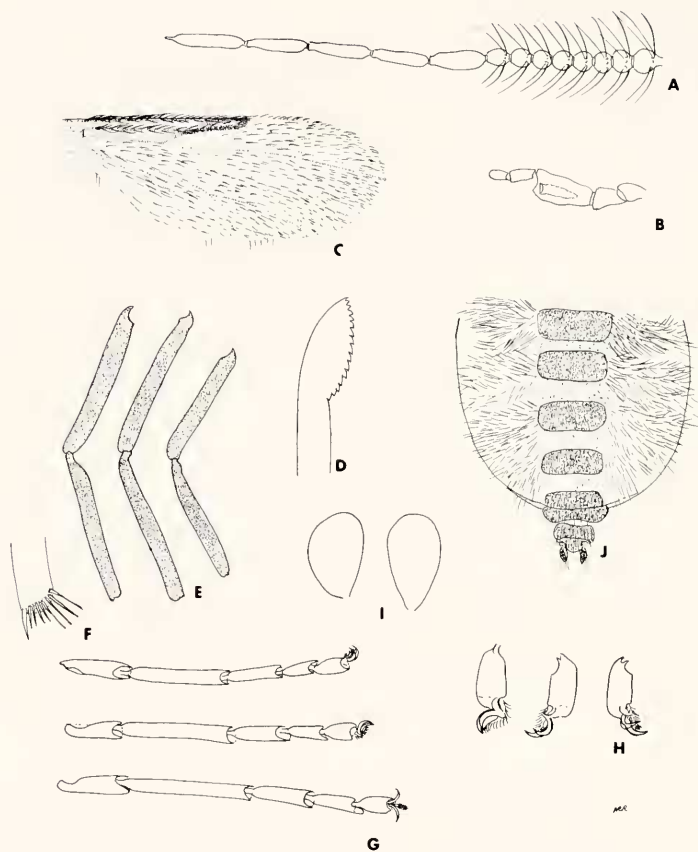


FIG. 3. *Forcipomyia obesa*, female (Barro Colorado I., C. Z.): a, antenna, b, palpus; c, wing, d, mandible; e, femora and tibiae, color pattern; f, hind tibial comb; g, tarsi, left to right, of fore, mid, and hind legs; h, fifth tarsomere and claws, left to right, of fore, mid, and hind legs; i, spermathecae; j, abdomen of distended specimen.

golden hairs, probably the most obvious feature of this species. The synonymy of *mayeri* Forattini and Lane (= *crudelis* Mayer) is based on Mayer's figure of the mouthparts showing the distally expanded mandible, together with his statement that the legs of his species were paler than those of *obesa*, of which he had the loan of the type specimen for comparison. Seguy figured the palpus of *wagneri* with a broad, rounded, distolateral expansion, and stated that the legs were

pale, with a trace of distal dark spot on the hind femur, fitting *ixodoïdes*. The characters used by Mayer (1937) and Seguy (1941) in their keys separating *ixodoïdes*, *crudelis*, *obesa*, and *wagneri*, based on palpal and tarsal segment proportions, are of little value.

Forcipomyia (*Microhelea*) *obesa* Costa Lima

(Figs. 1, 3, 4e-h)

Forcipomyia obesa Costa Lima, 1928: 85 (Brazil; female; fig. habitus, wing, antenna, palpus; compared with *ixodoïdes*); Lane, 1947: 163 (Belém, Brazil; female redescribed).

FEMALE.—Wing length 1.16 mm.

Head: Brown, including antenna and palpus. Antenna (fig. 3a) with lengths of flagellar segments in proportion of 30-35-36-26-27-28-28-30-56-56-55-55-85; AR 1.40. Palpal segments (fig. 3b, 4g) with lengths in proportion of 25-32-65-36-22; third segment moderately swollen, sensory pit opening on a prominent ventrodistal expansion; PR 2.18. Mandible (fig. 3d, 4f) with teeth darkened and borne on a prominent distolateral expansion as in *ixodoïdes*; 20 teeth present. Maxilla (fig. 4e) well developed, moderately stout distally, bearing a double row of stout, knoblike blunt teeth.

Thorax: Dark brown; mesonotum and scutellum with dense, golden, long semierect hairs, and short appressed setae. Legs (fig. 3e) yellowish; femora with broad subapical brown bands; mid tibia brownish, fore and hind tibiae with narrower brownish bands; hind TR 0.59. Wing (fig. 3c) with dense appressed black macrotrichia, those on costal margin and over radial cells forming a blackish stigma; CR 0.52. Halter brownish infuscated.

Abdomen: (fig. 3j) brown; covered dorsally and on pleura with long, slender, black, striated scales, mixed on pleura with long, slender, golden hairs; sternum with slender brownish hairs. Spermathecae (fig. 3i, 4n) without necks, ovoid to saclike, subequal, each measuring 0.092 by 0.065 mm.

MALE.—Unknown.

DISTRIBUTION.—Brazil, Colombia, Costa Rica, Panama.

TYPE.—Holotype, female, São Gabriel, Alto do Rio Negro, Amazonas, Brazil, October 11, 1927, J. F. Zikan, from phasmid. Mounted on slide under nos. 501-502 in collection of Instituto Oswaldo Cruz, Rio de Janeiro, Brazil.

SPECIMENS EXAMINED.—BRAZIL: Belém Harbor, Pará, September 27, 1969, H. A. Wright, light trap, 1 female; Nova Teutonia, Santa Catarina, January-April 1965-1969, F. Plaumann, ex *Anisomorpha dentata* Stal (det. Gurney), 35 females. COLOMBIA: Oledueto de Pacifica, 10 km NW Dagua, November 27, 1969, R. E. Woodruff, light trap, 2 females; Rio Raposo, Valle, March 1964, V. H. Lee, light trap, 1 female. COSTA RICA: San Carlos, coll. Schild and Bergdorf, taken from type of phasmid, *Stratocles multilineatus* Rehn, 1 female. PANAMA:

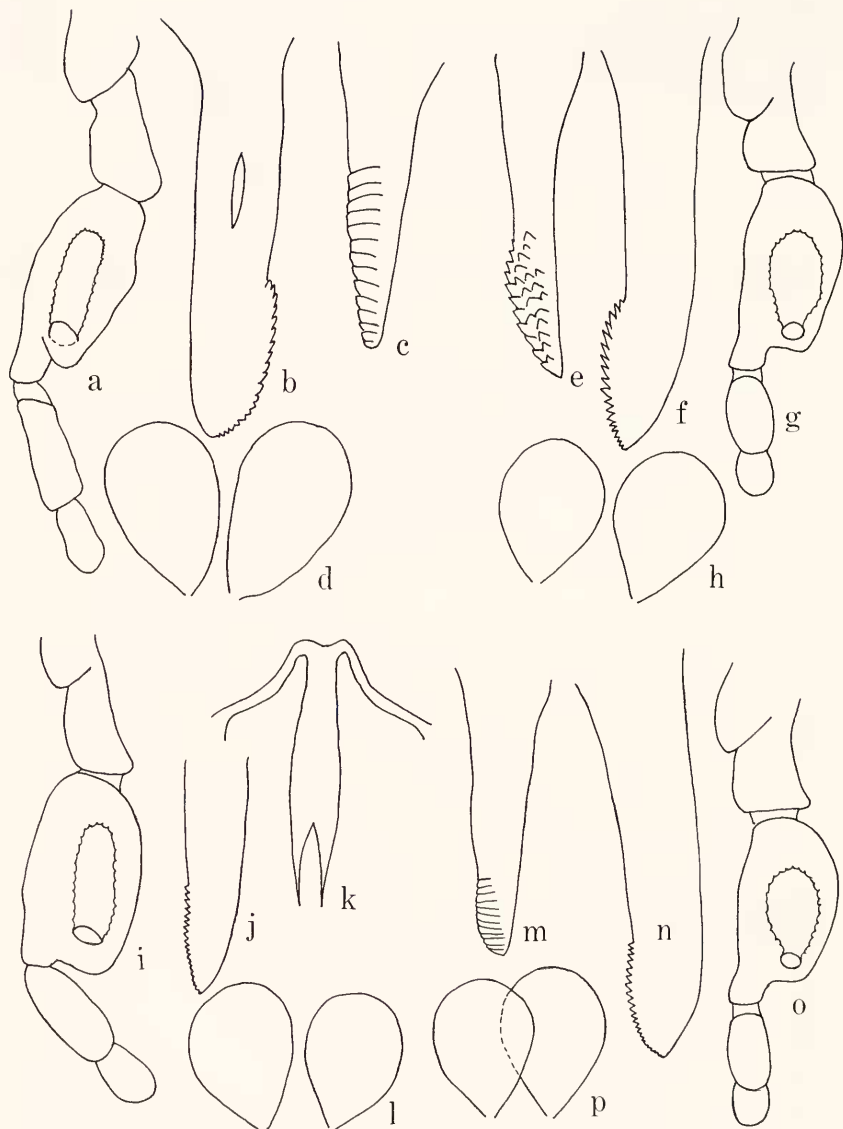


FIG. 4. *Forcipomyia* (*Microhelea*) spp.: a-d, *ixodoides* (Rio Raposo, Colombia); e-h, *obesa* (Barro Colorado I., C. Z.); i-l, *willistoni* (El Verde, Puerto Rico); m-p, *amazonica* (Manaus, Brazil); a, g, i, o, palpus; b, f, j, n, mandible; c, e, m, maxilla; d, h, l, p, spermathecae; k, parameres.

Barro Colorado Island, C. Z., July 18, 1956, C. W. and M. E. Rettenmeyer, on phasmid, 4 females; Cerro Campana, July 1967, W. W. Wirth, attacking phasmid, *Pseudophasma* sp. (det. A. B. Gurney), 1 female; Santa Rita Ridge, March 8, 1959, S. Breeland, ex *Stratocles* sp. (det. Gurney), 1 female.

Discussion.—*Forcipomyia obesa* is readily distinguished by its dark-banded legs, distally expanded mandible with coarse teeth, and the marked ventrodistal projection on the third palpal segment bearing the sensory pore usually at its apex. Costa Lima's fine illustrations of the palpus show the latter character especially well.

In the parasitized Brazilian specimens of *Anisomorpha dentata* collected by Mr. Plaumann, the favorite site of attachment of the midges was in the membranes around the coxae (22 midges), on the abdominal pleura (1 midge), or in the intersegmental membranes of the abdominal terga (7 midges). Dr. Rettenmeyer's specimens were attached to the articulation of the femur and tibia of the middle and hind legs.

Forcipomyia (Microhelea) amazonica Wirth, new species

(Fig. 4m-p)

FEMALE.—Wing length 1.54 mm.

Head: Yellowish brown; antennal segments 3-10 and palpal segment 3 yellow; antennal segments 11-15, palpal segments 4-5, and lobes of labellum contrasting dark brown. Antenna with lengths of flagellar segments in proportion of 32-26-26-26-28-28-30-36-54-60-55-60-82; AR 1.34. Palpal segments (fig. 4o) with lengths in proportion of 30-35-76-35-20; third segment broadly swollen, sensory pore opening subapically on broadly rounded ventrodistal portion; PR 1.77. Mandible (fig. 4n) with 23-25-small, dark brown teeth, the proximal ones not greatly enlarged, not arising from a lateral expansion as in *ixodoides* or *obesa*. Maxilla (fig. 4m) well developed and stout distally, with stout, scraperlike, transverse teeth as in *ixodoides*.

Thorax: Dark brown; mesonotum and scutellum with dense, golden, long semierect hairs, and short appressed setae. Legs yellowish, without brownish bands; hind TR 0.56. Wing with dense, long, appressed brownish macrotrichia, those on costal margin and over radial cells not more prominent; CR 0.51. Halter deep brownish infuscated.

Abdomen: Brown; covered with moderately long, fine, brownish hairs, those on pleura not striated, but arising from prominent brownish tubercles; terga bearing long, slender, striated, blackish scales. Spermathecae (fig. 4p) two, without necks, ovoid, unequal, measuring 0.087 by 0.065 mm and 0.080 by 0.059 mm.

MALE.—UNKNOWN.

DISTRIBUTION.—Brazil.

TYPES.—Holotype, female, 1 female paratype, Manaus, Amazonas,

Brazil, September 19, 1969, H. A. Wright, light trap (Type no. 71145, USNM).

DISCUSSION.—*Forcipomyia amazonica* can be recognized by the dark brown color of the five distal antennal segments and two distal palpal segments, contrasting sharply with the bright yellowish proximal segments, by the broad third palpal segment with rounded ventrodistal expansion, the unbanded yellowish legs, and the presence of only slender brown hairs on the abdominal pleura, both striated scales and long golden hairs lacking on the pleura. The mandible is slender distally, without the distolateral expansion found in *ixodooides* (Fiebrig-Gertz) and *obesa* Costa Lima.

Forcipomyia (*Microhelea*) *willistoni* Wirth, new species

(Fig. 4i-1)

FEMALE.—Wing length 1.75 mm.

Head: Dark brown, antennal segments 3-10 contrasting yellowish. Antenna with lengths of flagellar segments in proportion of 40-32-32-33-33-33-35-40-72-75-70-72-100; AR 1.40. Palpal segments (fig. 4i) with lengths in proportion of 30-42-80-45-30; third segment broadly swollen, sensory pore opening subapically on broadly rounded ventrodistal portion; PR 1.65. Mandible (fig. 4j) tapering distally, without distolateral expansion, with 22 fine teeth on distal portion. Maxilla well developed and stout distally, with only lightly sclerotized transverse corrugations.

Thorax: Dark brown; mesonotum and scutellum with abundant golden brown long semierect hairs and short appressed setae. Legs dark brown, tarsi yellowish brown; hind TR 0.49. Wing with dense, long, appressed, dark brown macrotrichia, those on costal margin and over radial cells conspicuously longer and denser; CR 0.51. Halter dark brown infuscated.

Abdomen: Brown; covered with long, slender, blackish striated scales arising from inconspicuous, black-pigmented, integumental bases. Spermathecae (fig. 4l) two, without necks, ovoid, unequal and relatively small, measuring 0.087 by 0.062 mm and 0.080 by 0.058 mm.

MALE.—Similar to the female, with the usual sexual differences; antenna with lengths of flagellar segments in proportion of 60-40-40-40-165 (fused segments 7-10)-45-155-95-80-100; AR (12-15 combined divided by 3-11 combined) 0.85. Palpal segments with lengths in proportion of 30-35-72-40-30, third segment moderately swollen on proximal 0.6, small deep sensory pit opening by slightly smaller pore at about midlength of segment, distal third of segment slender; PR 3.00. Hind TR 0.48. Genitalia quite similar to those of *fuliginosa*. Dististyle nearly straight, tapering to slender, slightly bent, pointed

tip. Aedeagus shield-shaped, with low transverse basal arch, basal arms short and directed anterolaterad, sides convex, distally converging to slender, papilliform tip. Parameres (fig. 4k) with slender basistylar apodemes; fused for 0.7 of total length, fused proximal portion moderately slender near base, slightly broadened subapically, the prongs of distal fork tapering rapidly to filiform tips directed caudad.

DISTRIBUTION.—Brazil, Jamaica, Puerto Rico.

TYPES.—Holotype, female, El Verde, Puerto Rico, Luquillo Mts., July 8, 1970, C. G. Moore, from phasmid (Type no. 71146, USNM). Allotype, male, El Verde, Puerto Rico, Barrio Rio Grande, no date, G. E. Drewry, sticky trap. Paratypes, 1 male 12 females, as follows: BRAZIL: Nova Teutonia, Santa Catarina, October 1962, April 1963, February 1971, F. Plaumann, at light, 7 females. JAMAICA: Hardwar Gap, Portland Parish, Green Hill, August 17, 1969, R. E. Woodruff, light trap, 1 female. PUERTO RICO: Same data as holotype except collected February 13, 1970, by C. G. Moore and D. M. Whitacre, 2 females; same data as allotype, 1 male.

DISCUSSION.—*Forcipomyia willistoni* is structurally the least modified of the species belonging to this group, but has quite distinctive color characters, including the prominently bicolored antenna, dark brown palpi, and dark brown legs. The unmodified mandibles and maxillae, and the abdominal vestiture with abundant striated slender dark brown scales present and long golden hairs or enlarged basal tubercles lacking, place this species fairly close to the basic *fuliginosa* stock, from which it differs most in the expanded labella.

This species is dedicated to the memory of that great American dipterist, Dr. Samuel W. Williston, to whom we are indebted for much of our early knowledge of West Indian Diptera. Dr. Williston's note (1908) quoted in the introduction concerning the phasmid parasite he knew from the West Indies probably refers to this species. Whether Williston's specimen still exists is problematical; I have not found it in my examination of Williston's St. Vincent ceratopogonids or in his material in the University of Kansas.

One female from Finca Carpentaria, Tambo, Cauca, Colombia, 2500 m, July 9, 1964, V. H. Lee, light trap is only provisionally referred to *willistoni* because it fits in all characters except two: the vestiture of the abdominal pleura, which consists of mixed black striated scales and long golden hairs like those of *obesa*, and the shape of the third palpal segment, in which the sensory pore opens at the apex of a

subconical ventrodiscal expansion somewhat like that of *obesa*. This specimen may possibly represent a distinct species, but the material is too limited for any conclusions.

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2.0119 A review of the "stick-ticks," neotropical biting midges of the *Forcipomyia* subgenus *Microhelea* parasitic on walking stick insects (Diptera: Ceratopogonidae).

ABSTRACT.—*Microhelea* Kieffer is recognized as a subgenus of *Forcipomyia* Meigen (N. STATUS) to include the world-wide caterpillar parasite, *F. fuliginosa* (Meigen), and four species of a neotropical group that includes the "stick-ticks" which suck blood from stick insects of the orthopterous family Phasmidae. The stick-ticks were previously placed in the genus *Phasmidohelea* Mayer, which is now synonymized with *Microhelea* (N. SYN.). Two new species are described, *F. amazonica* from Brazil, habits unknown, and *F. willistoni*, parasitic on phasmids in Puerto Rico.—Willis W. Wirth, *Systematic Entomology Laboratory, USDA, c/o U. S. National Museum, Washington, DC 20560*.

Descriptors: Diptera; Ceratopogonidae; Neotropical; *Forcipomyia* spp.; stick-ticks; walking stick insects; Orthoptera; Phasmidae; [phasmida].